PREDATION OF *APHIDECTA OBLITERATA* (L.) (COL.: COCCINELLIDAE) BY RAINBOW TROUT *SALMO IRIDEUS*

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MOST LADYBIRDS ARE warningly coloured and contain distasteful or toxic chemicals as a defence against predation by vertebrates. Many studies have investigated the palatability of ladybirds to birds, but some have also been offered to three of the other main vertebrate groups; mammals, reptiles and amphibians (Morgan, 1896; Pocock, 1991; Morton Jones, 1932; Frazer & Rothschild, 1960; Meinwald *et al.*, 1968; Pasteels *et al.*, 1973; Marples *et al.*, 1989; Majerus & Majerus, in press). We can find no record of the palatability of ladybirds to fish being tested, nor can we find any records of coccinellids being preyed upon by fish. We wish to put such an occurrence on record here.

On the evening of 19 August 1995, Neale Taylor caught a rainbow trout (*Salmo irideus*) on an upland loch, Lochenbreck Loch, near Gatehouse of Fleet, Kirkcudbrightshire. On gutting the fish and checking the stomach contents (a good angler should always try to determine what his quarry has been eating), he found three larch ladybirds (*Aphidecta obliterata* (L.)), which were identified by his wife Helen Taylor. The loch is bordered on three sides by conifer plantations, mainly sitka spruce (*Picea sitchensis*), lodgepole pine (*Pinus contorta*) and Japanese larch (*Larix kaempferi*). *Aphidecta obliterata* was very common in the area during the summer.

This observation is interesting for not only because, at present, it appears to be unique, but because the coccinellid involved was *A. obliterata*. This ladybird is unusual because, unlike most coccinellids, it is not warningly coloured, the elytra, in Britain, being almost invariably light to mid-brown and either unmarked or bearing a pair of small diagonal streaks towards the posterior. The lack of warning coloration in this species has been the subject of some speculation. Several authors have stated that *A. obliterata* does not reflex bleed (secrete droplets of fluid from pores in the legs) (Brakefield, 1985; MAjerus & Kearns, 1989). This statement is erroneous (Majerus, 1994). The reflex fluid produced by this species is much clearer and paler than that of most other ladybirds, and is consequently more difficult to see, particularly against the usual light-brown elytra of this species.

Although *A. obliterata* does reflex bleed, the question of whether this species is chemically protected is unresolved. Pasteels *et al.* (1973) could detect no alkaloids in the reflex blood of this species and argued that the species is unlikely to be unpalatable to vertebrate predators, but relies on camouflage to avoid the attention of predators. In support of this contention, Pasteels *et al.* (*op. cit.*) published the results of feeding *A. obliterata* to Japanese quail, showing that the quail ate all the ladybirds offered. The value

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of these tests is not clear as two out of the three quail used also ate all *Adalia bipunctata* L. and *Caliva 14-guttata* (L.) offered, and both these species contain alkaloids (Tursch *et al.,* 1973; Pasteels *et al.,* 1973) and have been found to be repulsive to some birds (Marples, 1990; Majerus, unpublished data).

It is, however, certainly possible that *A. obliterata* secretes reflex fluid that has no defensive properties. Its ability to reflex bleed may be a hang-over from its evolutionary past, just as, for example, our appendix is. However, although this is possible, its likelihood has to be judged in the light of the cost of reflex bleeding when no benefit is gained by deterring predators. It is known that fluid loss can be highly detrimental to coccinellids, particularly in the winter when opportunities to replenish reserves are rare (Majerus, 1994). One might then expect that there would be a significant selection pressure to relinquish the ability to reflex bleed if such behaviour bears a cost and confers no benefit. In addition, it should be realised that the failure to find alkaloids in the reflex fluid of *A. obliterata* does not mean that the reflex fluid cannot have protective properties. Many other types of defensive chemical are known. Indeed, Pasteels *et al.* (1973) report that two other species of coccinellid in which alkaloids were not found (*Subcoccinella 24-punctata* (L.) and *Rhizobius litura* Fabr.) were not attacked by ants. In this regard it is notable that one of us who has tasted the reflex fluid of *A. obliterata* found it to be most disagreeable.

One piece of circumstantial evidence that *A. obliterata* is less well protected chemically than other coccinellids, comes from work on the interactions between ladybirds and aphid-tending wood ants (*Formica rufa* L.) (Majerus, 1989). When ten live ladybirds of each of nine species were placed in the vicinity of ant-tending aphid colonies, most (apart from the myrmecophilous ladybird *Coccinella magnifica* Redtenbacher) were vigorously attacked by the ants. The majority of the ladybirds ran away or dropped off the foliage when attacked. The ants did not attempt to capture or kill most of the ladybirds. They appeared to be interested only in removing them from the vicinity of the aphid colonies. Only nine ladybirds were killed by the ants. One, a 14-spot ladybird (*Propylea 14-punctata* (L.)) was left after being killed. The other eight were carried away towards the nest. Of these, one was a pine ladybird (*Exochomus 4-pustulatus* (L.)), the other seven being *A. obliterata*. Additional support comes from tests in which dead *A. obliterata* that had been torn open were offered to *Myrmica rubra* (L.) ants and were found to be acceptable as food (Pasteels *et al.,* 1973).

Two questions arise from the above observation. First, do fish commonly eat ladybirds of a range of species, or are the chemical defences of most coccinellids effective against them? Second, how palatable is *A. obliterata* to vertebrates other than fish? Both of these questions should be answerable with simple experiments. For now we simply add one more to the growing list of known enemies of ladybirds.

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Exceptionally early spring records in 1995

The relatively mild winter 1994/95 and several very warm days in late April 1995 at Dartford have resulted in several moth species emerging earlier than usual. In the species listed all but one, possibly two, concern over-wintering pupae, and for all species except one the emergence has been earlier than recorded previously over a twenty-five year period. All records refer to my garden m.v. light. The table gives the earliest record for 1995 for each species, the previous earliest record and the average first record for the period.

Most of these early records reflect a general early emergence in the species, this being especially noteworthy in the case of *Selenia tetralunaria.*